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NATIONAL BUREAU OF STANDARDS REPORT

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Thirteenth Progress

Report

on the

Mechanisms of Fire Ignition and Extinguishment

by

E. C. Creitz

Covering the period 1 August to 31 October 1962

for

Bureau of Ships

Department of the Navy

Code 638

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NATIONAL BUREAU OF STANDARDS

Thirteenth Progress Report

Mechanisms of Fire Ignition and Extinguishment

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1. Summary

Mr. Mills has experienced considerable difficulty in producing negative ions of known mass in the inlet system of the new mass spectrometer. Velocity modulation of the ion beam has been discovered to be important and restricts the duty cycle to a measured 60%.

2. The Mass Spectrometer

Various means have been tried for producing negative ions of known mass in the inlet system. Evaporation of salts from a hot filament results in a copious supply of positive ions but extremely few negative ions. The field intensities have been mapped using data from an analogue computer, built for the purpose, and it is predicted that electrons in the vicinity of the hot filament should have energies appropriate for attachment to gas molecules. Oxygen has been tried without result. It is planned to try carbon tetrachloride and sulfur hexafluoride which attach electrons having even lower energies than in the case of oxygen.

In Mr. Mills' original design it was expected that the duty cycle would approach 100% since ions would be accelerated by a saw-tooth voltage with a very short decay time. It was expected that velocity modulation of the ion beam would be negligible so that a duty cycle approaching 100% should be obtained. Velocity modulation is caused by the dependence of velocity upon the time of entry of an ion into the fields between the drift tubes. Measurements made during the quarter indicated that the effect was not negligible and it had the effect of dropping the duty cycle to 60%. This is an extremely high duty cycle, even so, compared to 2% and 0.2% in other types of mass spectrometers.

The saw-tooth generator previously in use had insufficient power to supply the desired voltages, so a new one has been designed.